Candidate Name	Centre Number	Candidate Number
		2

General Certificate of Education
Advanced Subsidiary/Advanced

312/01

BIOLOGY
MODULE BI2

A.M. WEDNESDAY, 9 January 2008
(1 hour 30 minutes)

For Examiner's Use Only

Total Marks	

INSTRUCTIONS TO CANDIDATES

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded of the necessity for good English and orderly presentation in your answers.

The quality of written communication will affect the awarding of marks.

No certificate will be awarded to a candidate detected in any unfair practice during the examination.

BLANK PAGE

1. *(a)* What is meant by the term *monoculture*? [1]

.....

.....

(b) Name the apparatus that indirectly measures the rate of transpiration. [1]

.....

(c) Name the protein deficiency disorder common in malnourished children. [1]

.....

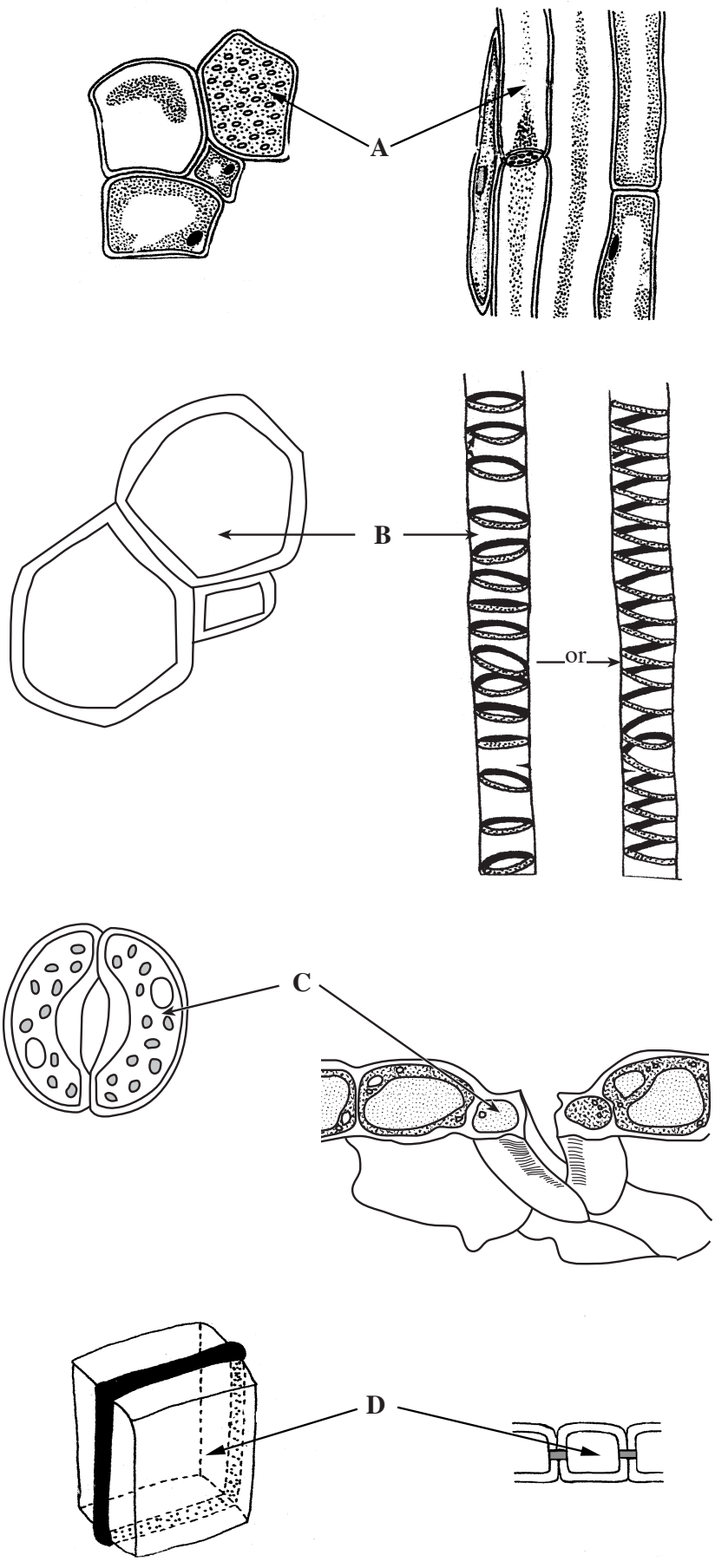
(d) In ecology what is meant by the term *biomass*? [1]

.....

.....

(Total 4 marks)

2. The diagrams show different views of **four** types of plant cells labelled **A** to **D**.



(a) Identify these cells in the table provided, and give the function of each cell. [8]

Cell type	*Name of cell type*	*Function of cell*
A		
B		
C		
D		

(b) State the plant organ where cell **D** is found. [1]

.....

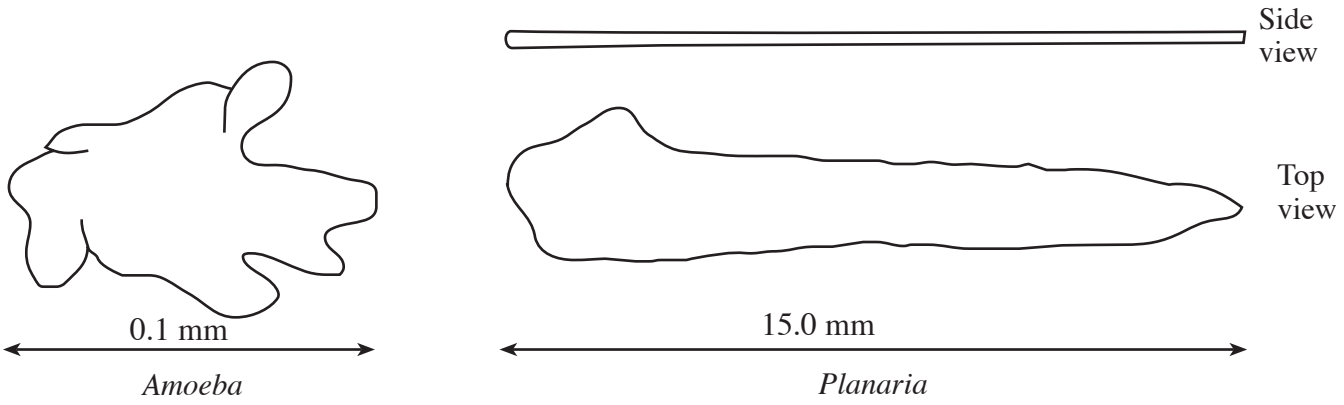
(Total 9 marks)

3. *(a)* Define the term *diffusion*. [1]

.....

.....

(b) The drawings illustrate the size and shape of a unicellular organism, *Amoeba* belonging to the Protoctista, and a multicellular, long, thin, flattened worm, *Planaria*.



For each animal, briefly explain why simple diffusion provides an adequate gaseous exchange between the organism and the environment. [2]

Amoeba .....

.....

Planaria .....

.....

(c) The table below shows various dimensions of cubes of animal tissue.

Length of side (cm)	*Volume (cm^3)*	*Ratio of Surface area: Volume*
1	1	6:1
2	8	3:1

(i) State, in words, the quantitative relationship between length and the surface area/ volume ratio. [1]

.....

.....

.....

(ii) Large, multicellular organisms such as mammals, need a respiratory exchange surface.

I. Name the respiratory exchange surface in a mammal. [1]

.....

II. With reference to the table, explain the importance of this exchange surface to a mammal. [2]

.....

.....

.....

.....

(Total 7 marks)

4. The table shows the maximum and minimum blood pressures (in kPa) at various points in the human circulatory system.

	Blood pressure/kPa	
Location	*Maximum*	*Minimum*
Left ventricle	16.0	0
Right ventricle	3.32	0
Aorta	16.0	10.65
Pulmonary artery	3.32	1.06
Lung capillary	1.06	0.66
Muscle capillary in leg	2.00	2.00
Pulmonary vein	0.66	0.26
Vein in leg	0.66	0.66

(a) Explain the reason for the difference between the maximum pressure in the left and right ventricles and explain why this difference is necessary. [2]

.....

.....

.....

(b) Give **one** possible reason for the difference between the minimum aorta pressure and the minimum pressure in the ventricles. [1]

.....

(c) With reference to the **functions** of arteries and capillaries, explain why it is necessary to have a difference between their pressures. [2]

.....

.....

.....

.....

(d) (i) Compare the values between muscle capillaries and lung capillaries. [2]

.....

.....

(ii) Suggest an explanation for these differences. [1]

.....

.....

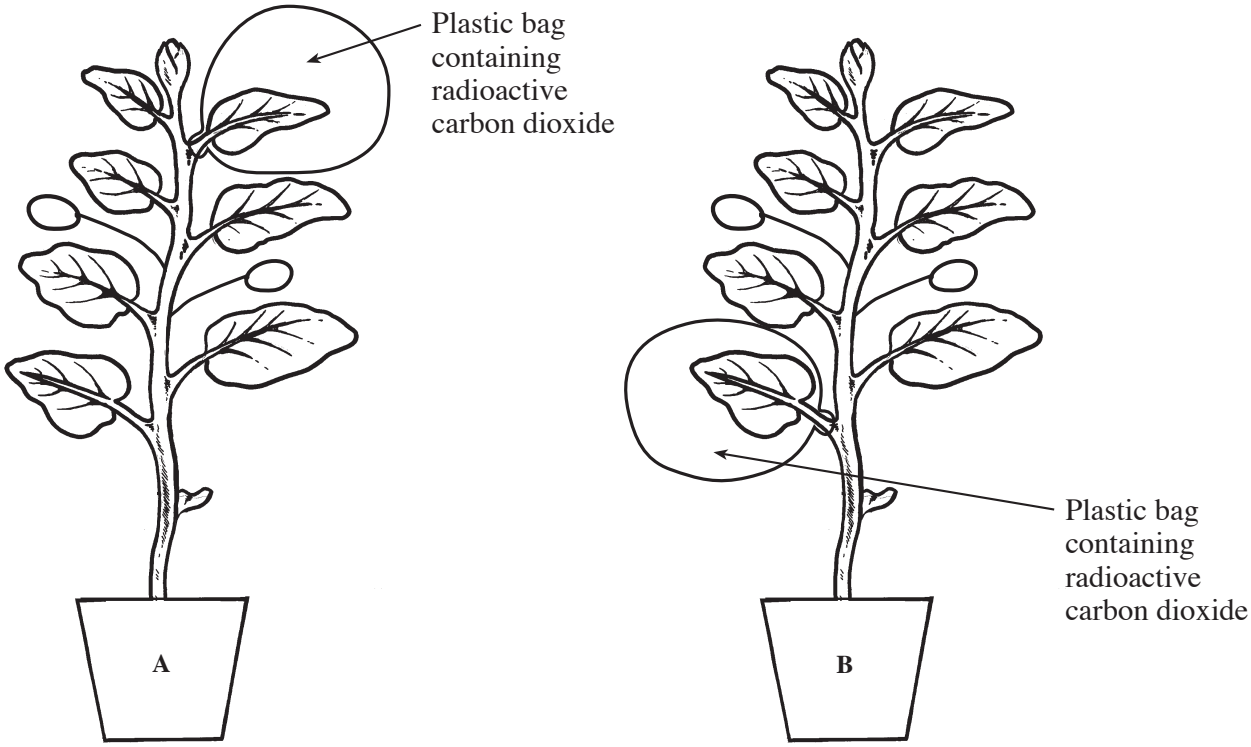
(e) Explain how it is possible for blood to return to the heart when the vein pressures are so low. [1]

.....

.....

(Total 9 marks)

5. An experiment was carried out to investigate the translocation of carbohydrate in a plant species.
Selected leaves were allowed to photosynthesise in the presence of radioactive carbon dioxide for 30 minutes by securing plastic bags over the leaves.
The treatment was applied to two plants of the same species that were producing fruit.
The plastic bag was then removed from the plants which were left for 24 hours.
The radioactivity of different parts of the plants was then measured.



Treated leaf on upper part of plant.

Treated leaf on lower part of plant.

(a) Suggest why the plants were left for 24 hours before the parts of the plants were analysed. [1]

.....

(b) The quantity of radioactivity found in various parts of the plants are shown in the table.

	Radioactivity (counts min^{-1})	
Parts of plants	**Plant A** *(leaf on upper part of stem treated)*	**Plant B** *(leaf on lower part of stem treated)*
Untreated leaf	230	170
Radioactive CO_2 treated leaf	11 200	11 300
Shoot tip	1 125	760
Stem	810	1 160
Fruit pod	9 050	4 520
Roots	850	2 700

(i) Given that the total radioactivity recorded in plant **A** was 23 265 counts min^{-1}, calculate the percentage radioactivity found at [2]

I. the fruit pod;

.....

II. the shoot tip.

.....

(ii) Suggest an explanation for these results. [2]

.....

.....

(iii) What are the **quantitative** differences between the pattern of radioactive carbohydrate translocation in the fruit pod and roots of plant **A** compared with those of plant **B**. [2]

.....

.....

(iv) Name a *source* and a *sink* in this experiment. [1]

Source .....

Sink .....

(v) What do the results suggest about the direction of movement between source and sink in plant **A** compared with plant **B**. [1]

.....

.....

(Total 9 marks)

6. The table shows the data obtained when two species of beetle **(A)** and **(B)** were reared **together**, and were given a constant source of food, over a two-year period.

	Number of beetles	
Weeks	*Species **A***	*Species **B***
0	20	50
20	50	80
40	40	120
60	30	160
80	10	180
100	0	190

(a) Plot the data in a suitable form on the graph paper opposite. [4]

(b) Explain the rapid change in beetle numbers over the first 20 weeks. [1]

.....

.....

(c) State what type of competition exists between the two populations of beetle. [1]

.....

(d) (i) Estimate the combined carrying capacity of the environment for the two species of beetles. [1]

.....

(ii) After what period of time is the carrying capacity reached? [1]

.....

(e) Suggest, with an explanation, what would happen to the numbers of species A if species B became infected with a parasitic microorganism at around 80 weeks. [2]

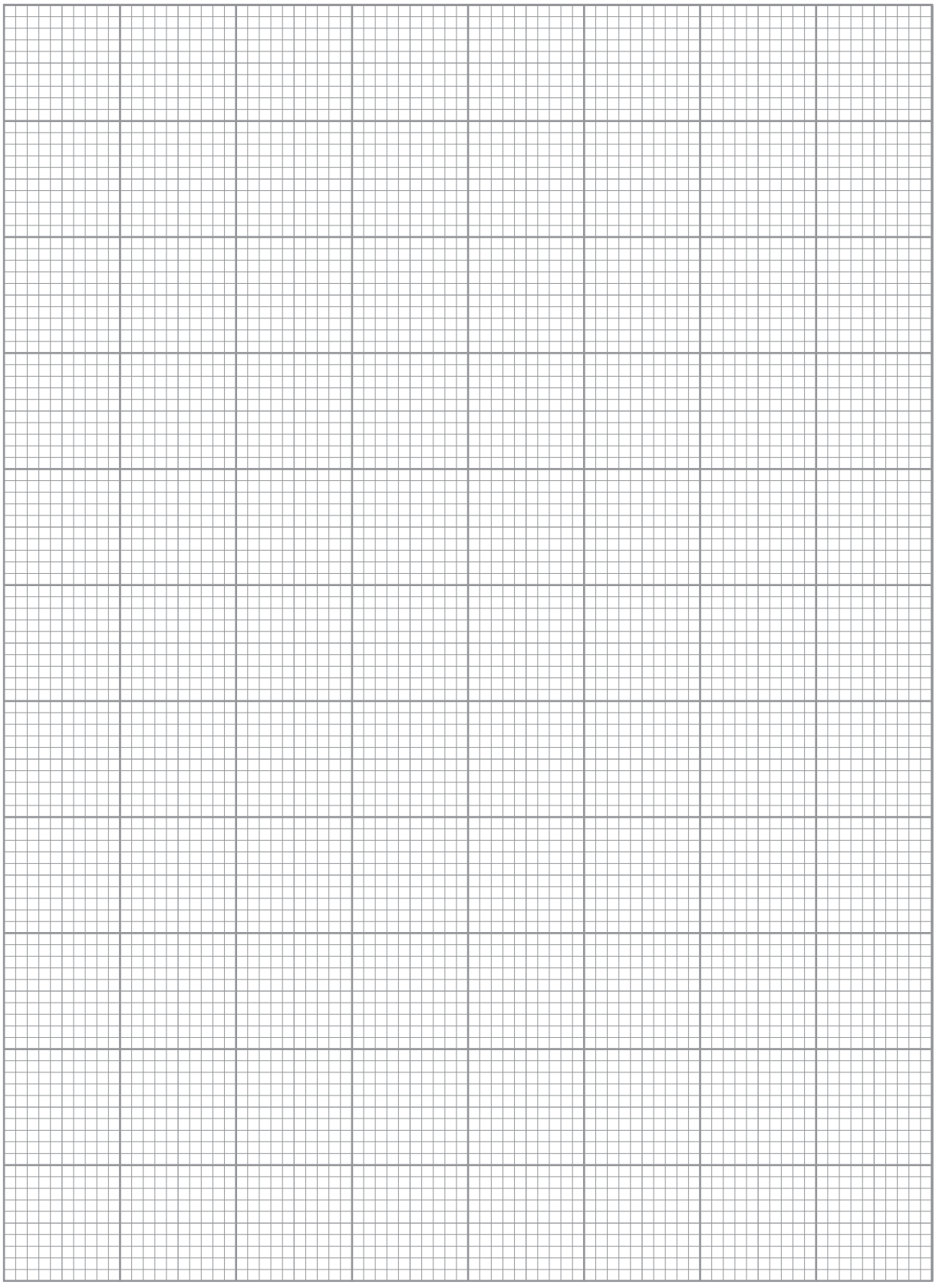
Suggestion .....

.....

Explanation .....

.....

(Total 10 marks)



7. *(a)* Apart from cost, state **two** disadvantages of using insecticides to control pests. [2]

.....

.....

(b) In agriculture what is meant by the term *integrated pest management*? [2]

.....

.....

.....

(c) Aphids (greenfly) feed on a variety of crops reducing the crop yield significantly.
Ladybird beetle larvae are a natural predator of aphids and may be used as a biological control agent.
Two separate experiments were carried out to determine the effect of contact insecticides on aphids and ladybird beetle larvae. Under these experimental conditions ladybird beetle larvae are not feeding on aphids. Contact insecticides are absorbed by aphids and ladybird beetle larvae, but not by plants.

(i) Table 1 shows the effect of the insecticide malathion on the percentage mortality (death rate) of aphids living on two varieties of cereal crop, A and B.

Table 1

Concentration of insecticide mgl^{-1}	*% mortality of aphids fed on crop A*	*% mortality of aphids fed on crop B*
0	2	8
5	8	32
10	20	80
20	45	83
30	73	88
50	81	94
100	92	95

I. At a concentration of insecticide of 10 mgl^{-1} compare the result for aphids fed on crop A with that for aphids fed on crop B. [1]

.....

II. Suggest an explantation for the difference in this result. [1]

.....

III. What evidence from the table supports your explanation. [1]

.....

(ii) Table 2 shows the percentage mortality of ladybird larvae sprayed with the same insecticide.

Table 2

Concentration of insecticide mgl^{-1}	*% mortality of ladybird larvae*
0	2
5	4
10	5
20	90
30	100
50	100
100	100

Compare the effectiveness of concentrations of insecticide of 10 mgl^{-1} and 20 mgl^{-1} on the mortality of ladybird beetle larvae. [1]

.....

.....

(iii) Using information from both tables 1 and 2, describe the effect of the insecticide at a concentration of 10 mgl^{-1} on the mortality of ladybird beetle larvae compared with aphid mortality. [1]

.....

.....

(iv) Complete the table advising a farmer regarding the level of concentration of insecticide that would be most suitable for use on each of the two crops. [1]

Crop	*Recommended level of insecticide application mgl^{-1}*
A	
B	

(v) I. Which crop, A or B, would be most suitable for using integrated pest management? [1]

.....

II. Give a reason for your choice. [1]

.....

.....

(Total 12 marks)

8. Answer **one** of the following questions.
Any diagrams included in your answer must be fully annotated.

Either, *(a)* (i) Describe the role of bacteria in the main processes of the nitrogen cycle. [7]

(ii) Discuss the various ways in which human activities influence the nitrogen cycle. [3]

(Total 10 marks)

Or, *(b)* (i) Describe how the rate of transpiration is **increased** by external factors. [7]

(ii) Describe and explain **three** features of the marram grass leaf that enable the plant to survive on sand dunes. [3]

(Total 10 marks)

Examiner only

Examiner only

(Total 10 marks)